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**Modeling,
Simulation, and Analysis
(MS&A)
Space User's Group
(SPUG) Meeting**

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Agenda

- The Problem
- MS&A Findings
- MS&A Recommendations
- JWARS (Case in Point)
- Space and CNO Functionality
- Efforts to Address the Problem
- Take Aways
- The SPUG



The Problem

Limited analysis to quantify the military utility (Added Value) of space systems

Limited ability to represent space in models and simulations for analysis ...also affects training & acquisition

Limited funding to address the problem through analysis, wargaming, and infusing space in war games/exercises

Need to start with requirements:

- Measures of Effectiveness / Performance (MOE/MOP)
- Model deficiencies
- Space functionality requirements
- Funding requirements



MS&A Findings

Defense Science Board Task Force Report titled “Space Superiority” dated Sep 99:

- "...nation currently lacks the necessary modeling and simulation capabilities required to fully and appropriately assess the “military utility and worth” of national security space systems.
- "...deficiency undermines our ability to correctly balance the funding priorities between space systems, weapons systems and other support junctions to maximize US military force combat effectiveness.

Army Transformation Wargame held April 2001 at Ft. Knox, KY After Action Report (AAR):

- "There was difficulty assessing or measuring the effectiveness of the Objective Force as situational awareness decayed during the campaign. The models used during the wargame lacked the ability to adequately assess the results of lethal and non-lethal space, CNO, and IO activities. In the end, there were numerous insights overlooked (across all domains of military operations) due to the lack of sufficient and relevant models"



MS&A Recommendations

Defense Science Board Task Force Report titled “Space Superiority” dated Sep 99:

- “The DSB Task Force recommends that a higher priority be placed on the modeling and simulation efforts focused on assessing the “military utility and worth of space” and that the Commander, US Space Command be assigned the responsibility for developing and operating such capability.”

Space Commission Report Findings, January 11, 2001:

- “To support exercises, wargames, and experiments, DoD must develop and employ modeling and simulation tools based on measures of merit and effectiveness that will quantify the effects of space-based capabilities (Pg 78).”

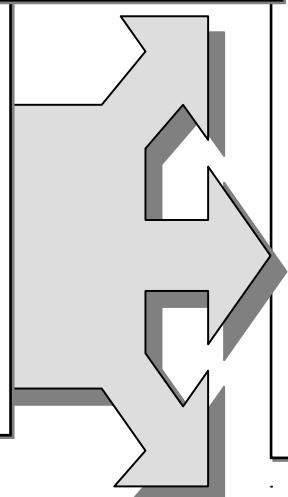


Background

May 95 DepSecDef approved JWARS as a long-term fix for Modeling and Simulation (M&S) weaknesses throughout each service and to replace legacy joint campaign models TACWAR and MIDAS

Users

- CINCs
- Joint Staff
- Services
- OSD
- Other DoD org's



Mission: Develop state-of-the-art, balanced simulation of joint, campaign-level warfare that:

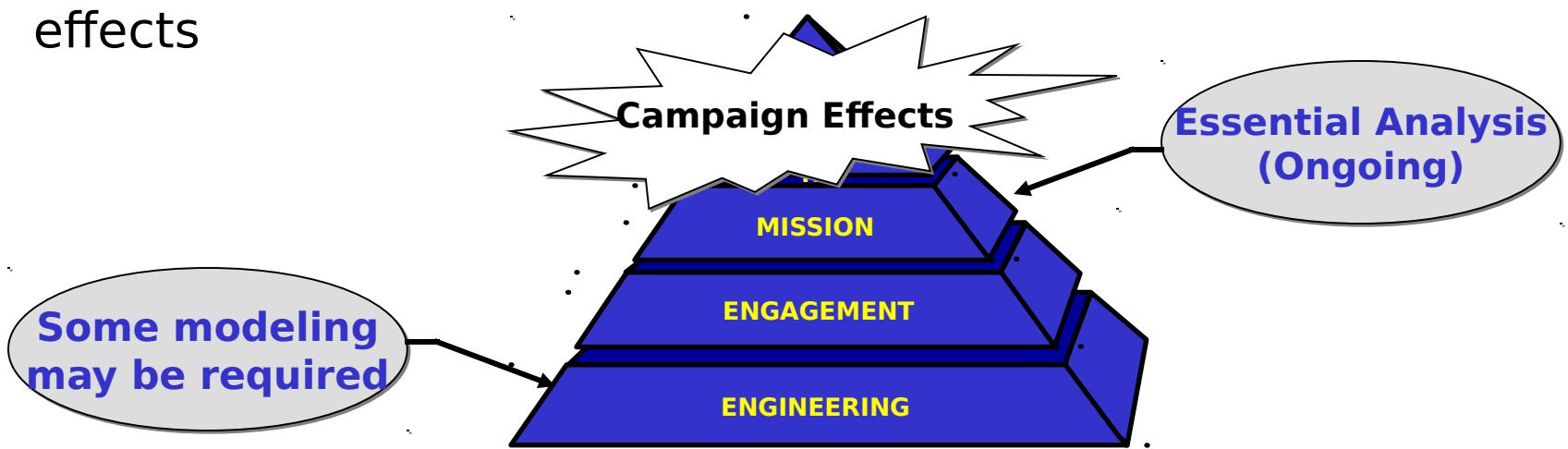
- Represents joint functions/processes, and component warfare operations
- Is able to assess current and future operational concepts to include Joint Vision 2010's
- Use C4 and ISR as the foundation for how entities perceive and interact with one another
- Supports analysis (USSPACECOM/AN)
- Planning and execution
 - Deliberate planning
 - Crisis action planning
- System effectiveness and trade off analysis
- Concept and doctrine development and assessment



Space Representation in JWARS



- Limited space functionality included in the JWARS ORD
- Not all Space Warfighter Support (Force Enhancement) areas are included at the the desired level of detail...yet
- Must quantify space effects at the engineering, engagement, and mission-level before we can determine campaign-level effects





Space Functionality

Warfighter Support (Formerly Force Enhancement)

Early Warning



Space Weather



Computer Network Operations (CNO)

Computer Network
Defense (CND)



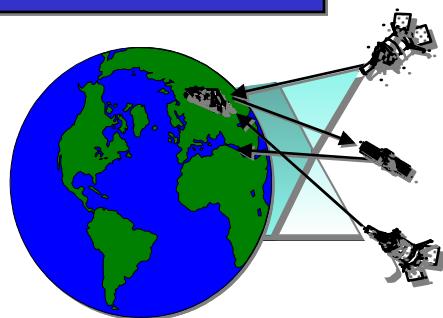
Computer Network
Attack (CNA)





Space Functionality (Cont.)

Space Control



Space Warfare (Formerly Force Application)



Four key Space Control tasks:

- Protection** of Critical Space Systems
- Prevention** of Unauthorized Access
- Negation** of Hostile Systems
- Surveillance** of Space

Space Systems Operations (Formerly Space Support)



Space Lift (Access to Space)



Satellite Ops



Space in Theater Campaign Models

Current (Legacy)

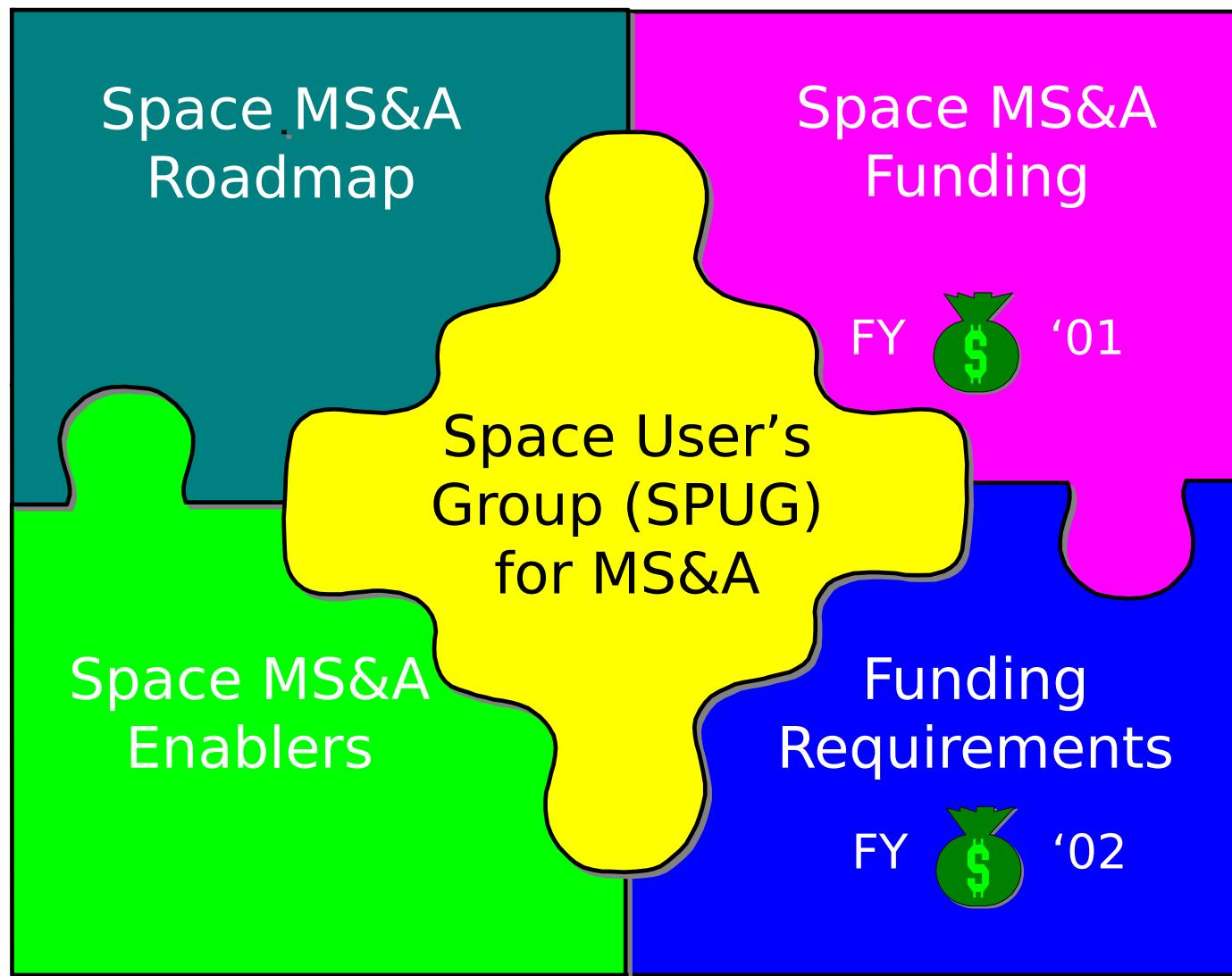
Campaign-Level Models that Include Space	
Model Name	How space is modeled
Tactical Warfare (TACWAR)...Joint	
N/A	N/A

Future (Developmental)

Campaign-Level Models that Include Space	
Model Name	How space is modeled
Concepts Evaluation Model (CEM)...Army	
N/A	N/A
Integrated Theater Engagement Model (ITEM)...Navy	
N/A	N/A
THUNDER...Air Force	
Global Positioning System (GPS)	Explicit
ISR	Explicit
Force Application (Space-Based Laser)	Explicit
Joint Integrated Contingency Model (JICM)?	
Joint Warfare Simulations (J WARS)...Joint	
J WARS Space Strategic Partner (J ASSPAR) Effort	Explicitly?
Army Warfare Simulation (AWARS)...Army	
?	
Navy Simulation System (NSS)...Navy	
?	?
STORM...Air Force	
?	?
Space Model (Space AOR)?	?
?	?

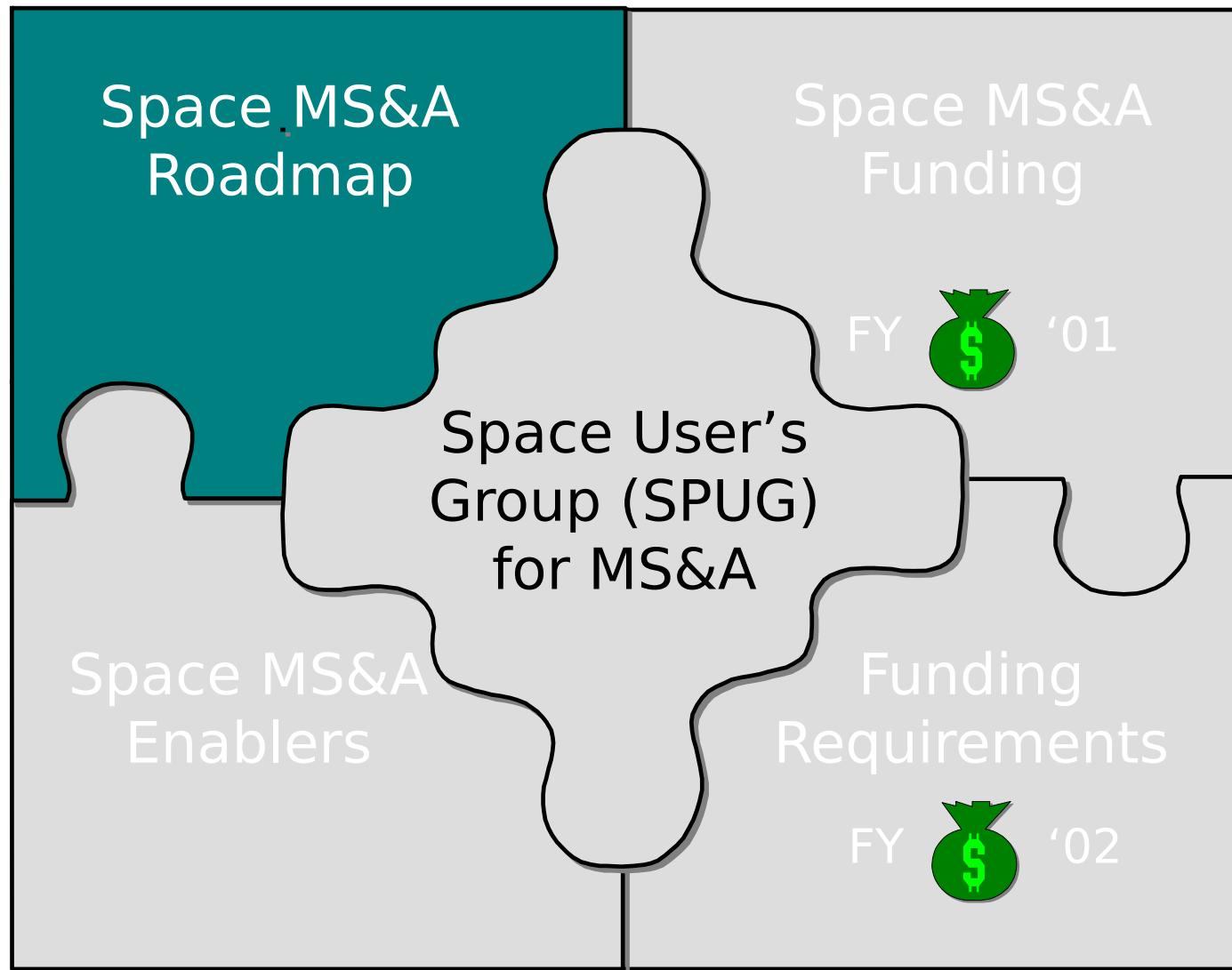


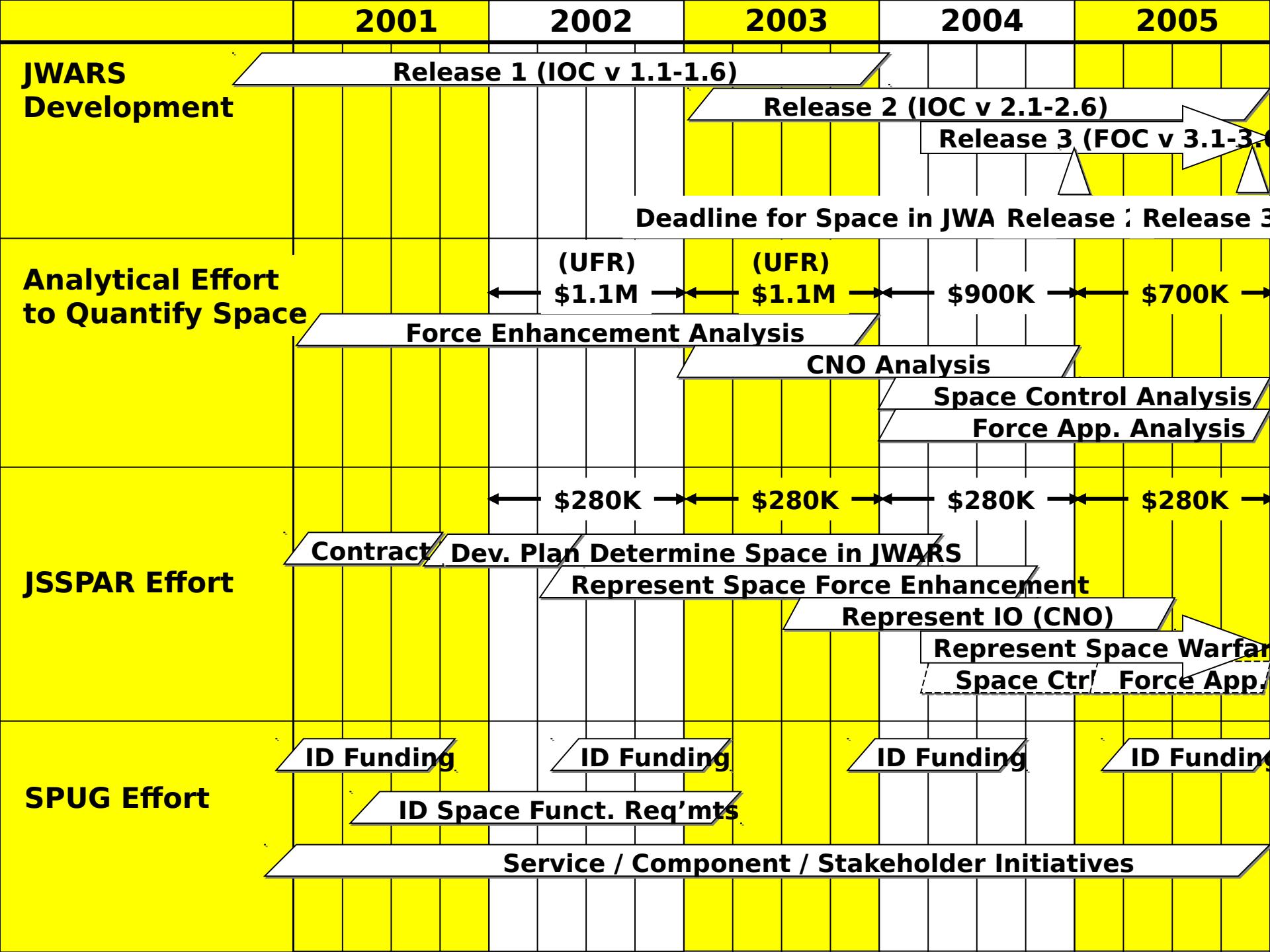
Efforts to Address the Problem





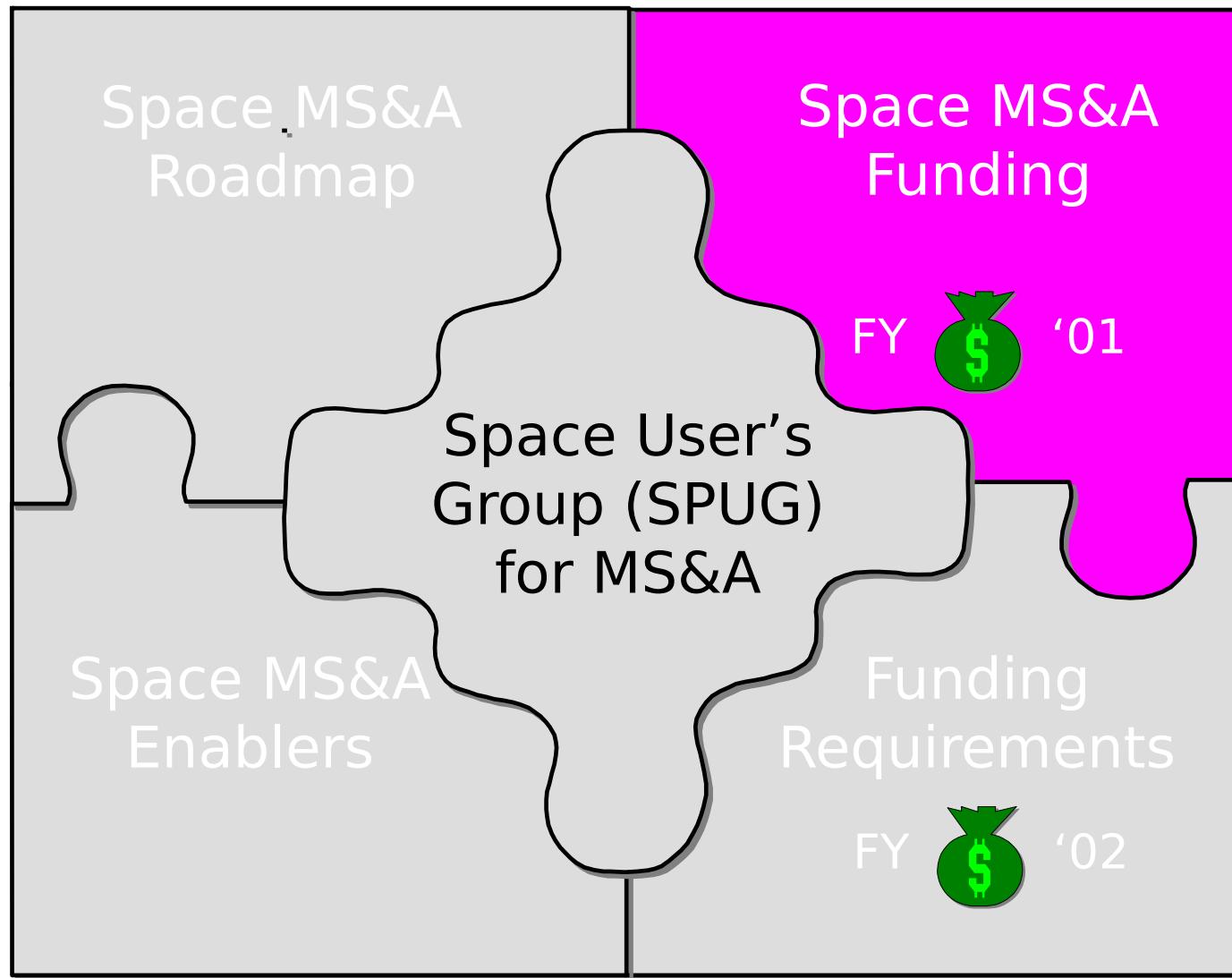
Efforts to Address the Problem







Efforts to Address the Problem





AF Space Command (AFSPC)



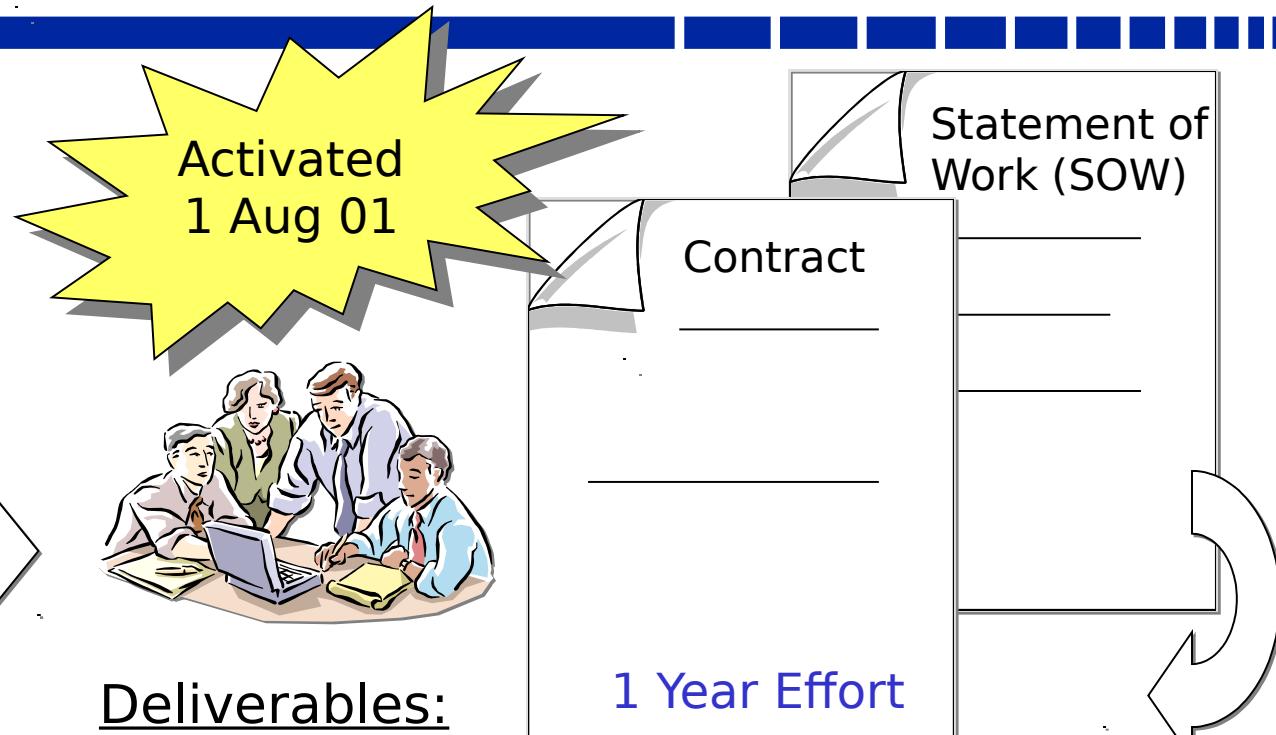
\$80K

JS J8
Joint Analytic Operations Program (JAOP)



\$200K

JWARS Space Strategic Partner (JASSPAR)

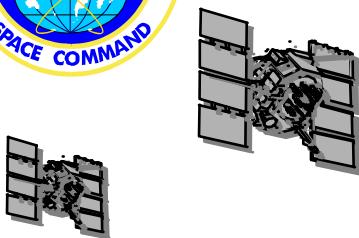


Deliverables:

1. Evaluate status of current space functionality in JWARS
2. Create repository of current studies that quantify space effects on the warfighter
3. Document space requirements "ORD"
4. Develop Space functionality in JWARS
5. Final Report w/ Executive Summary



GPS Analysis Support to CINCs



DMSO

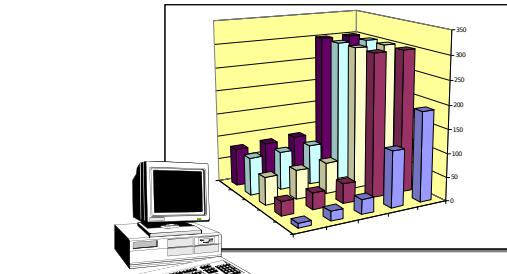


\$40K

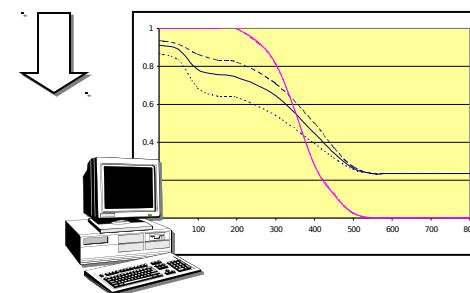
JS J8
Joint Analytic
Operations Program
(JAOP)



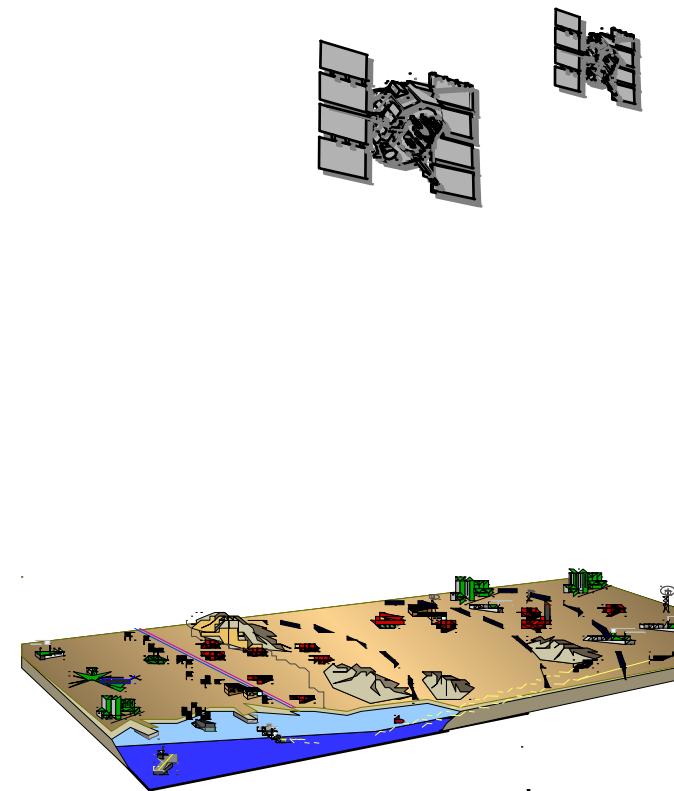
\$50K



**GIANT
GPS Model**



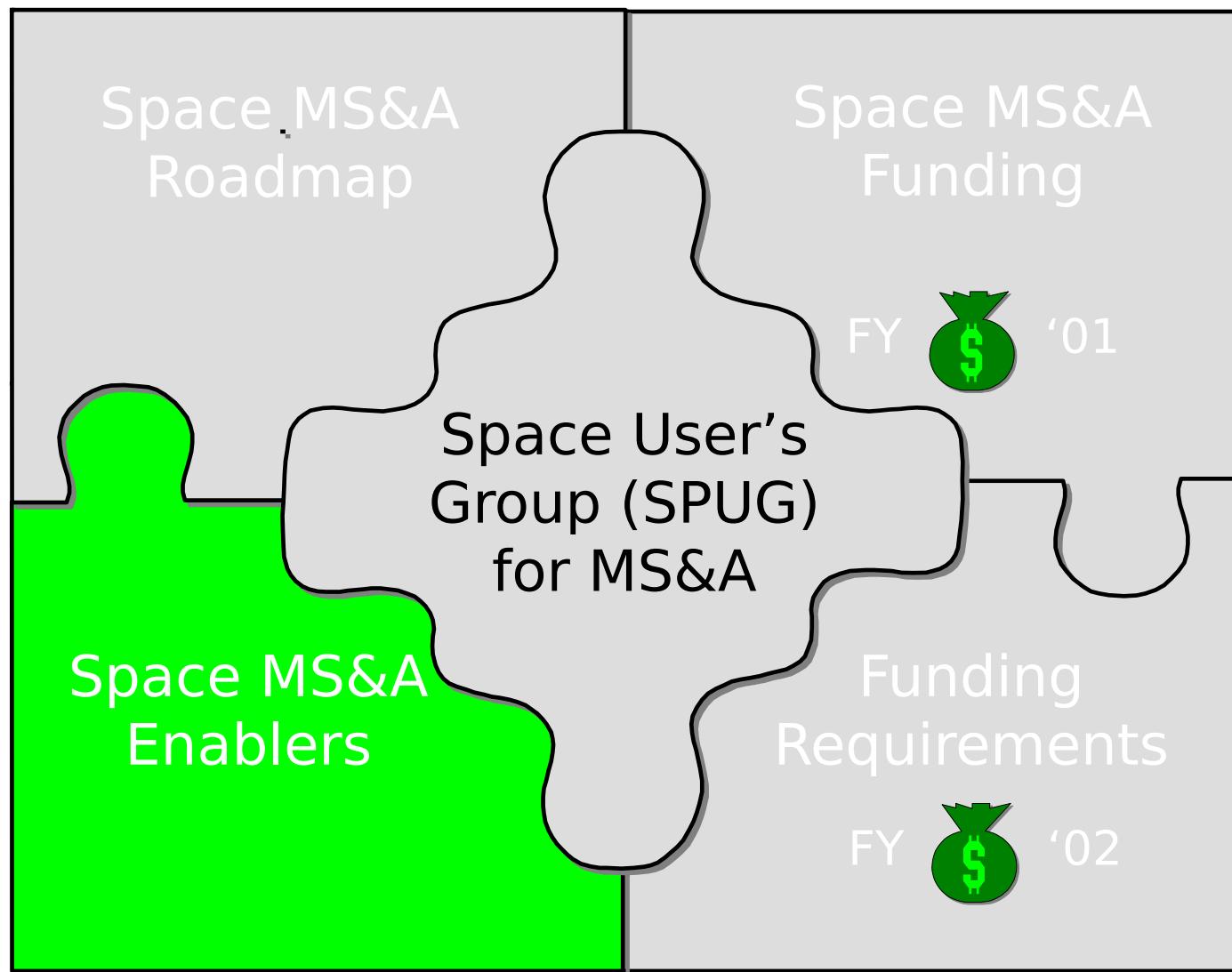
**Lightning
Aggregated Model** A blue arrow pointing to the right.



Milestone: Quantify
space in a theater
campaign scenario



Efforts to Address the Problem





Space Enablers

- ⇒ Develop a “space ORD” for space functionality in theater campaign modeling

Currently developing a Space Requirements Correlation Matrix (RCM)

- ⇒ Determine a funding strategy for the JWARS Space Strategic Partner (JASSPAR) and Space MS&A

Outlined in briefing (Space Roadmap)

- ⇒ Gain space representation in Joint Analytical Models Improvement Program (JAMIP) steering committee and Executive Committee for Models and Simulations

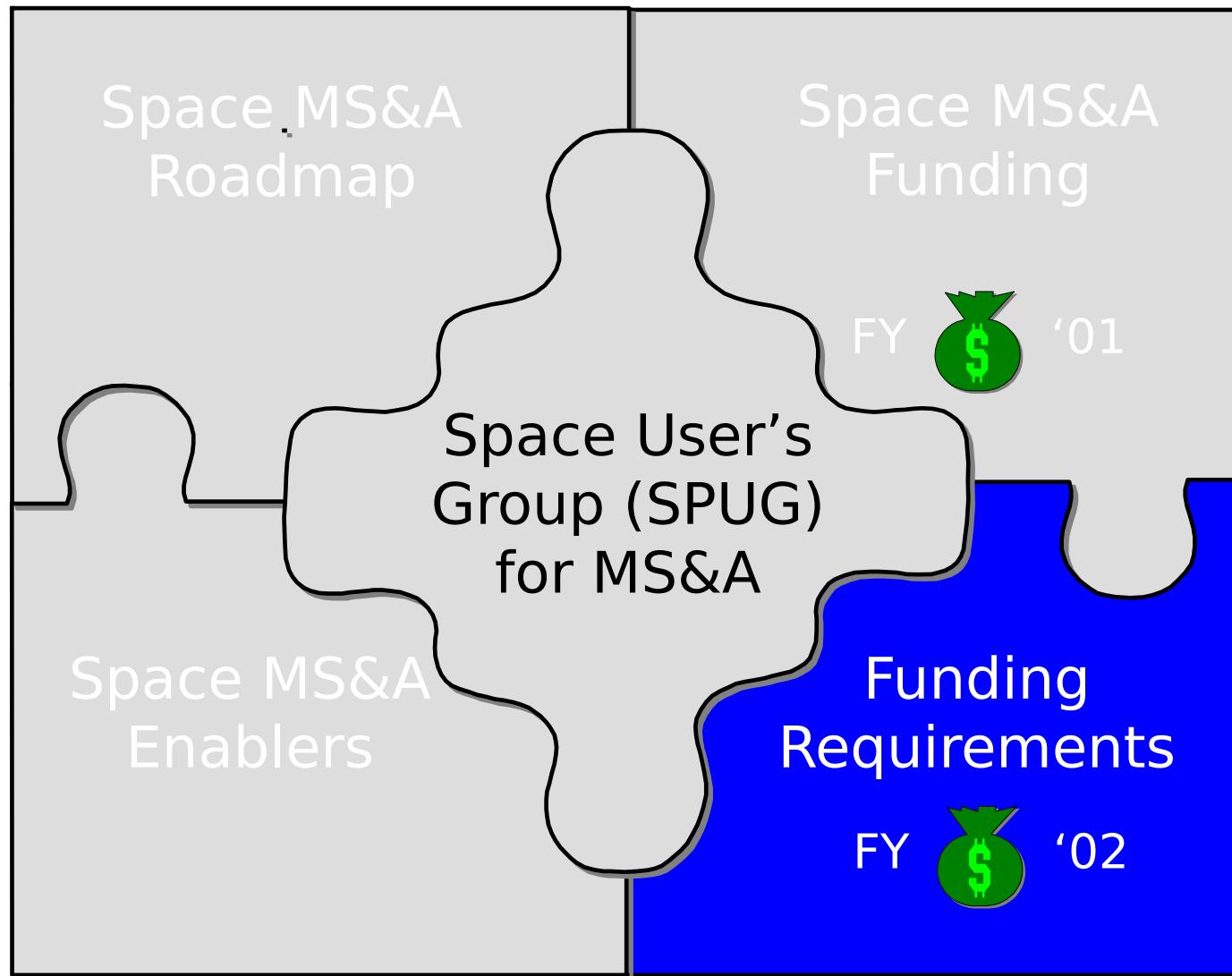
Space represented on the JAMIP steering committee

- ⇒ Evaluate the feasibility of modeling a space scenario (e.g. Schriever 2001) in JWARS (...on theater campaign models)

JWARS Releases **Determine Campaign Effects** **ugh...evaluate future**



Efforts to Address the Problem





07 Analysis Funding Requirements

Mission Category	Mission	Est Cost	Est. Category Cost
Force Enhancement	Communication	\$355,000	
	Intelligence	\$355,000	
	Warning	\$440,000	
	GPS (Navigation & Timing)	\$375,000	
	Weather	\$270,000	
Space Control	Surveillance	\$185,000	
	Protection	\$185,000	
	Prevention	\$185,000	
	Negation	\$185,000	\$740,000
Computer Network Operations	Defense	\$185,000	
	Attack	\$185,000	\$370,000
Space Support	Space Support	\$170,000	\$170,000
Space Warfare	Space Warfare	\$270,000	\$270,000
TOTAL		\$3,345,000	\$3,345,000

02/03
04-07
02/03
04-07
\$1.1M

Seed money to determine effects of space on a theater campaign scenario by...

- ✓ Determining MOEs / MOPs for space MS&A (Requirements Matrix)
- ✓ Modeling each area at the engineering / mission-level
- ✓ Aggregating mission-level effects into theater campaign modeling to show



Take Aways

Required Commitment

Identify space as a priority of funding for M&S and M&S as a priority for space



Gain commitment among the space and MS&A stakeholders (SPUG)



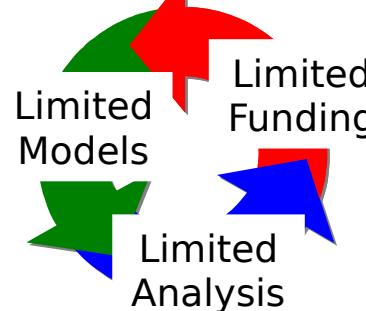
Identify/Develop a suite of space models for DoD



Conduct, lead, and leverage studies to quantify space systems



Restated Problem



Infuse space M&S into training exercises



Perform analysis of space-based systems

Imperatives

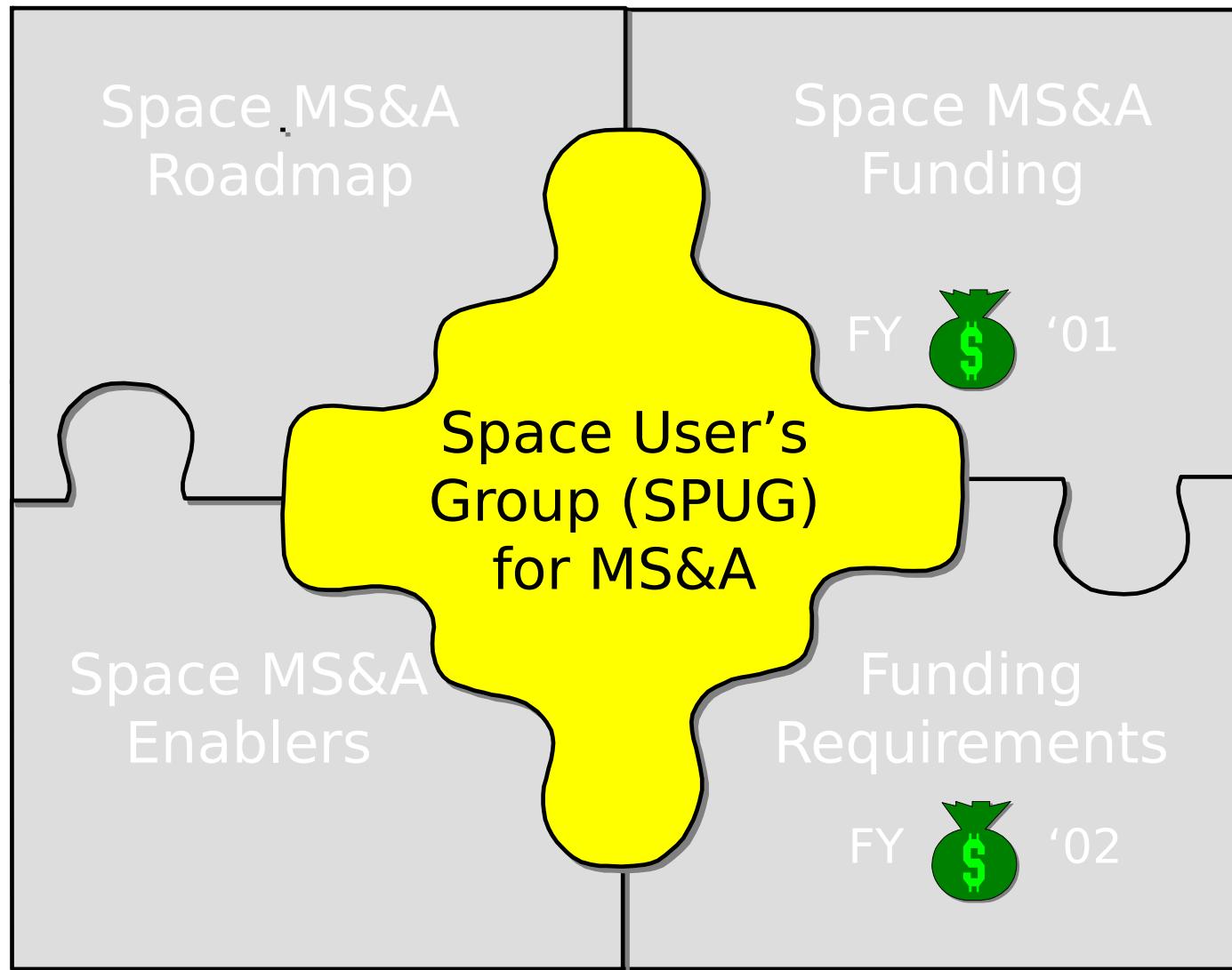
The opportunity is ripe to solve the problem with the right commitment

End State

Quantify the military utility (added value) of space systems in joint military ops



Efforts to Address the Problem





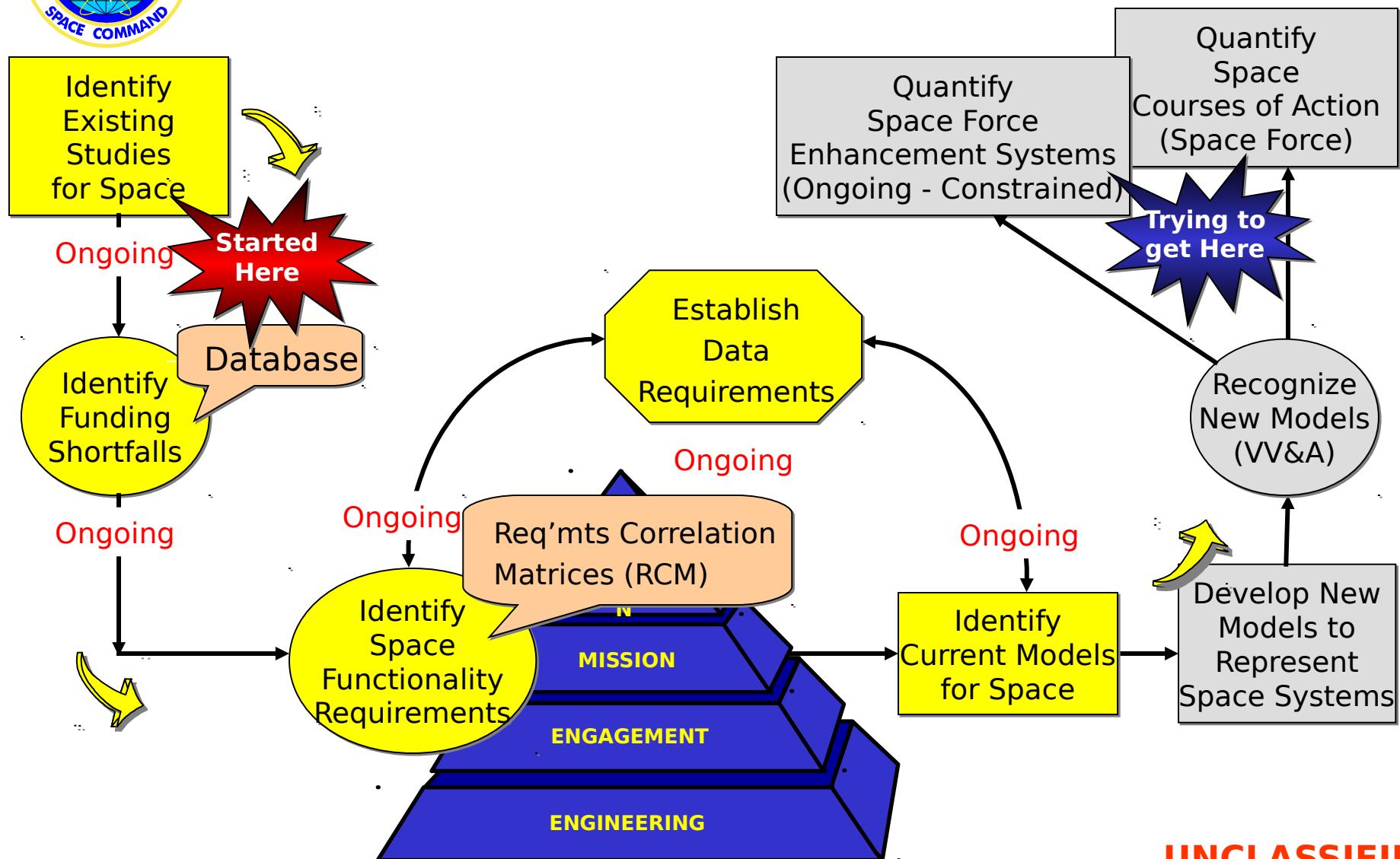
Forum of space and MS&A stakeholders gathered to:

- ⇒ Define requirements for:
 - ✓ Space functionality in MS&A
 - ✓ Funding priorities
 - ✓ MOEs/MOPs
- ⇒ Create a win-win situation for the joint, service component, and private/academic sector communities for quantifying space and CNO through MS&A.



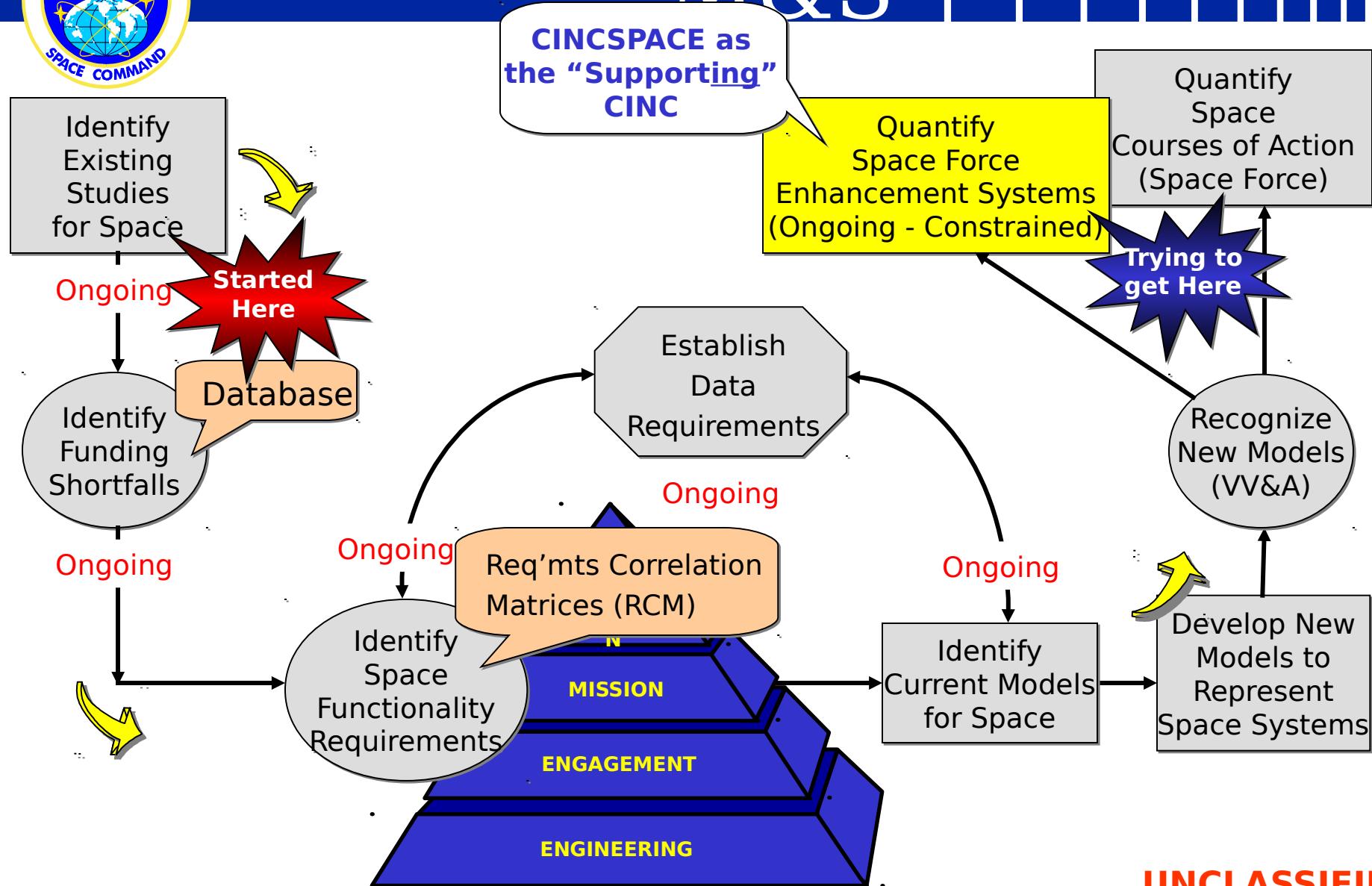
Space User's Group (SPUG) Strategy

TMXU



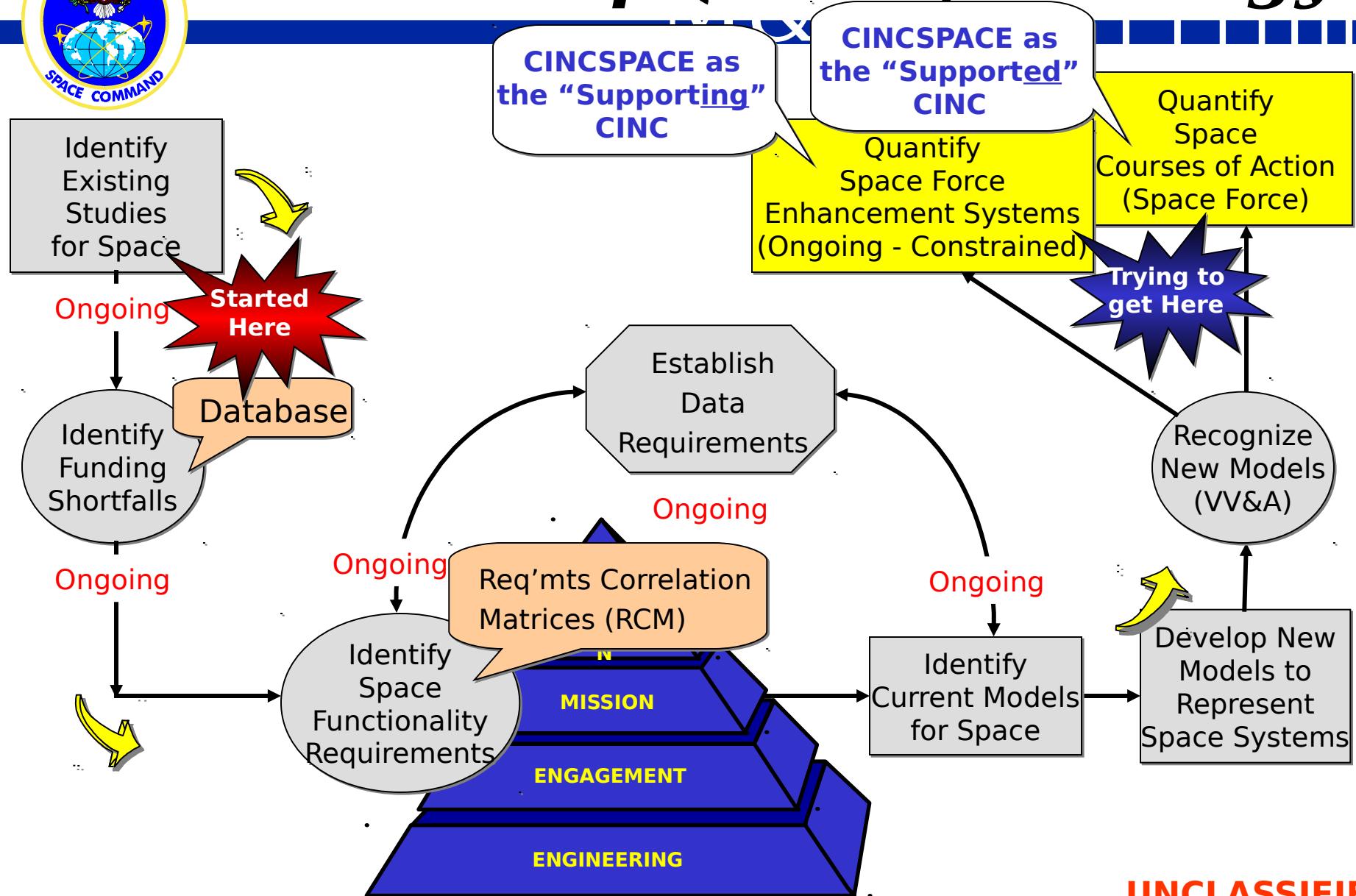


Space User's Group (SPUG) Strategy





Space User's Group (SPUG) Strategy





SPUG Agenda by Quarter

- August 2001:
 - ⇒ Initiate JWARS Space Strategic Partner (JASSPAR)
 - ⇒ Propose a SPUG roadmap
 - ⇒ Document starting point for space analysis (Services brief results)
 - ⇒ Identify need to ID space functionality requirements
- 13-14 December 2001:
 - ⇒ Identify ongoing space analysis initiatives (1st Cut)
 - ⇒ ID Space functionality requirements (1st Cut)
- March 2002 (Tentative):
 - ⇒ Refine space MS&A initiatives (2d Cut)
 - ⇒ Update Space functionality requirements (2d Cut)
- Jun 2002 (Tentative):
 - ⇒ Brief component Space MS&A initiatives